

STEREO Mission Design - 4

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Mission Design Analysis

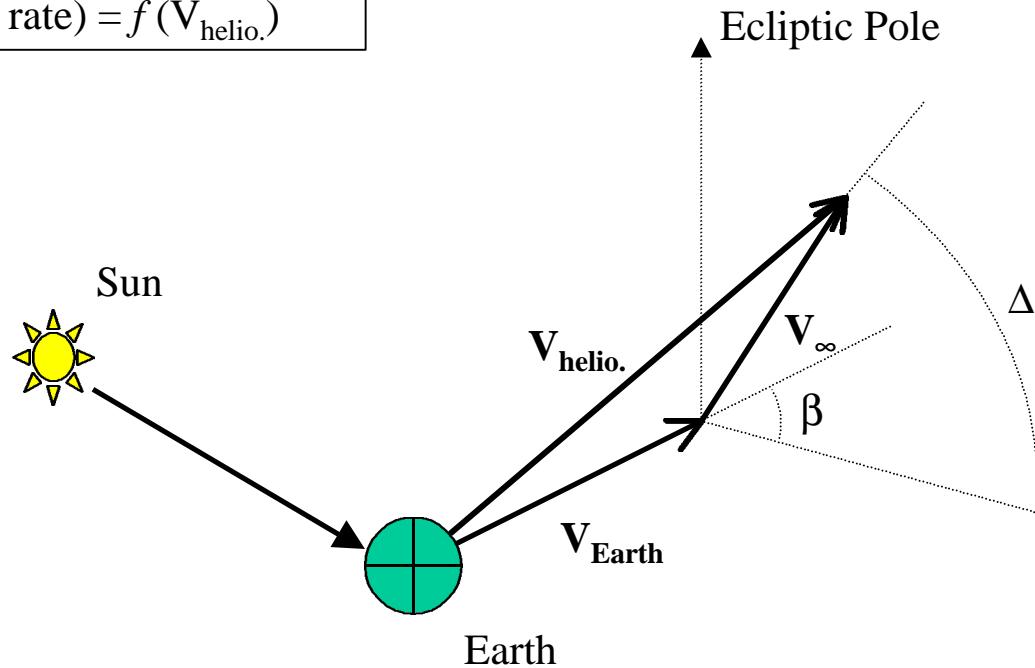
- Nominal Mission Design
 - Dwell angle/time per Science Definition Team report (pg. 30)
 - Leading Spacecraft
 - 20° from Earth $T = 200$ to 400 days
 - 45° from Earth $T = 600$ to 800 days
 - Drift rate = $20^\circ/\text{year}$ (derived)
 - Lagging (Trailing) Spacecraft
 - 30° from Earth $T = 200$ to 400 days
 - 60° from Earth $T = 600$ to 800 days
 - Drift rate = $28^\circ/\text{year}$ (derived)

Mission Design Analysis (cont'd)

- Athena-II Expendable Launch Vehicle
 - 93° Launch azimuth
 - Eastern range (CCAS/KSC)
 - STAR-37 upper stage
 - Preliminary ascent timeline provided by Lockheed-Martin
- Launch Dates
 - Leading - October 1, 2002
 - Smallest drift rate \Rightarrow minimize impact of launch delays for second spacecraft
 - Closer to equinox \Rightarrow minimize Sun-Probe-Earth angle for RF design
 - Lagging - December 1, 2002

Launch Parameter Definition

$$\begin{aligned}V_{\infty}^2 &= C_3 \\ \eta \text{ (drift rate)} &= f(V_{\text{helio}})\end{aligned}$$



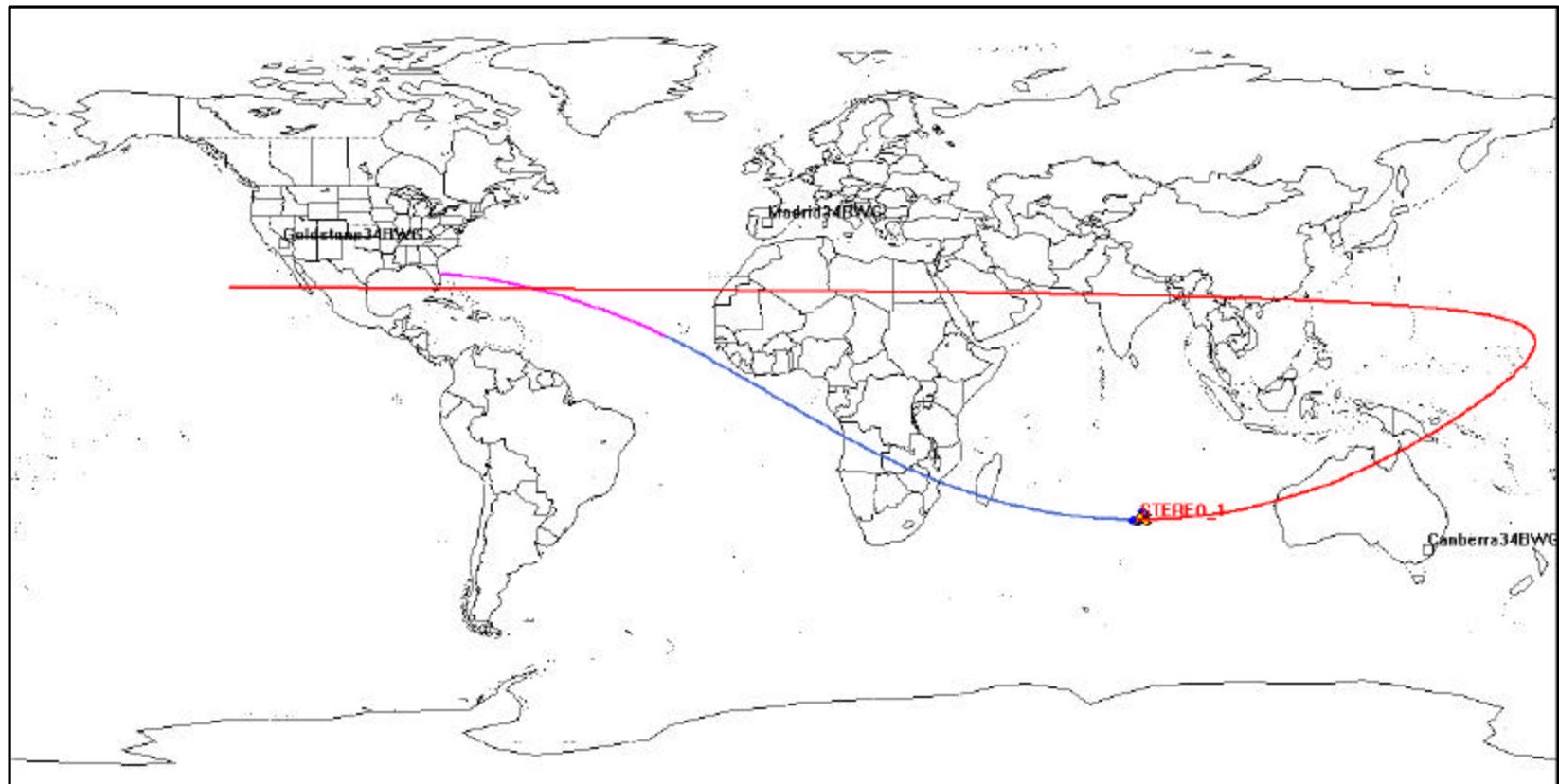
Nominal Mission Design

- Leading Spacecraft
 - Design Parameters
 - $C_3 = 1.0 \text{ km}^2/\text{sec}^2$, $\beta = -41^\circ$, $\Delta = 49^\circ$
 - $C_3 > C_{3\min} \approx 0.3 \text{ km}^2/\text{sec}^2$
 - Reduce sensitivity to launch vehicle dispersions
 - Tailor Sun-Probe-Earth angle characteristics for RF design
 - β selected maximize dwell time at desired separation angle
 - Δ selected to tailor Sun-Probe-Earth angle characteristics for RF design

Nominal Mission Design (cont'd)

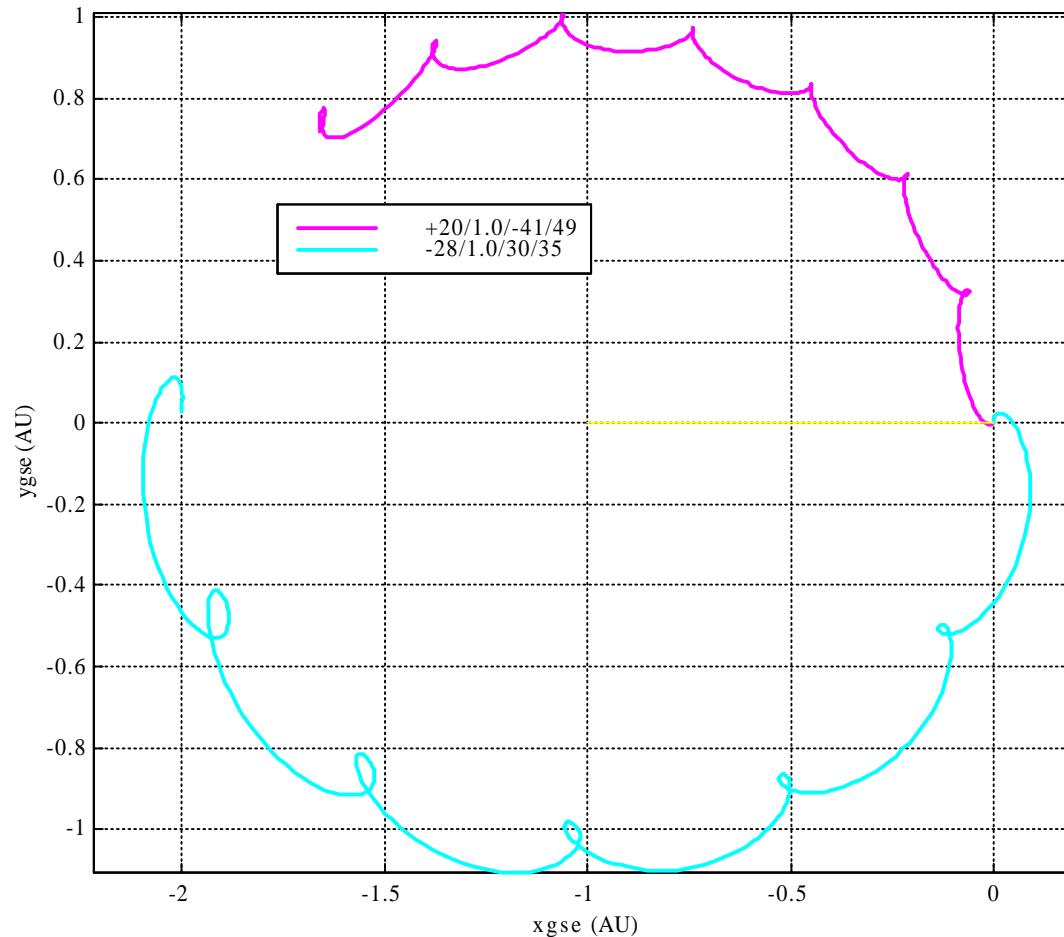
- Lagging Spacecraft
 - Design Parameters
 - $C_3 = 1.0 \text{ km}^2/\text{sec}^2$, $\beta = 30^\circ$, $\Delta = 35^\circ$
 - $C_3 > C_{3\min} \approx 0.6 \text{ km}^2/\text{sec}^2$
 - Reduce sensitivity to launch vehicle dispersions
 - β, Δ
 - Launch phase definitions identical to leading.
 - Impacts to dwell time/separation behavior
 - (TBD)

Early Mission Groundtrack



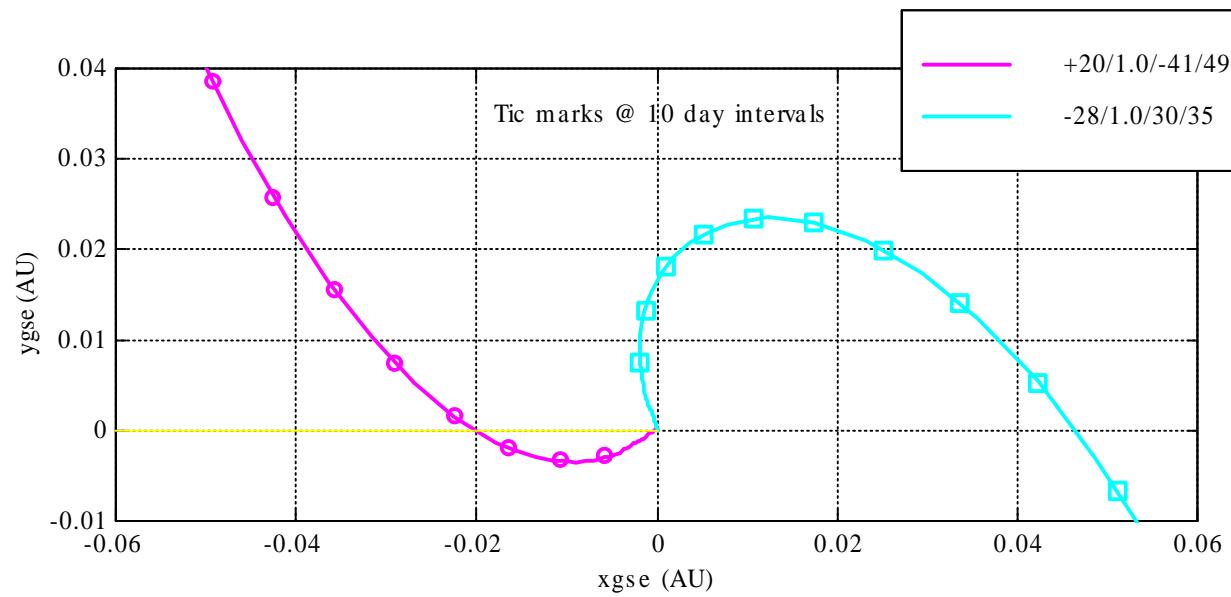
STEREO Orbit

(Geocentric Solar Ecliptic Coordinates)

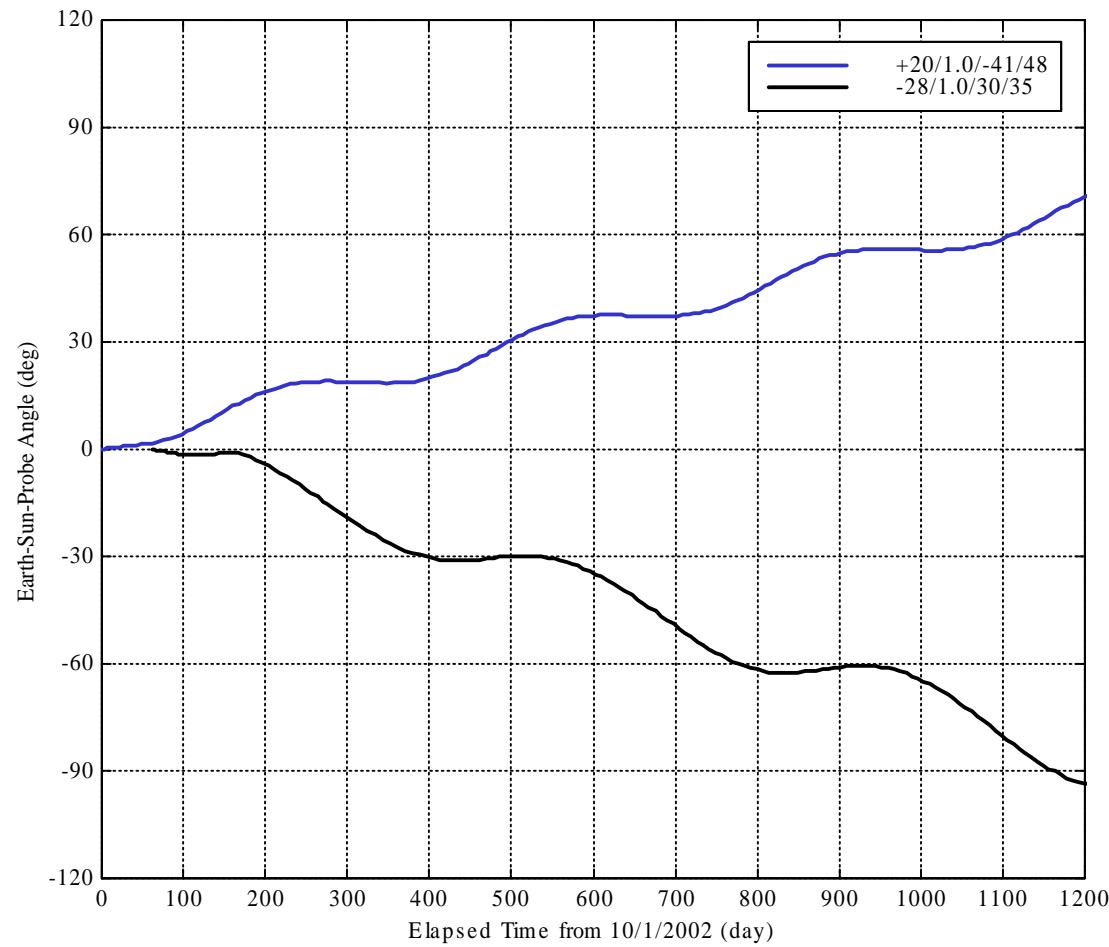


STEREO Orbit Detail

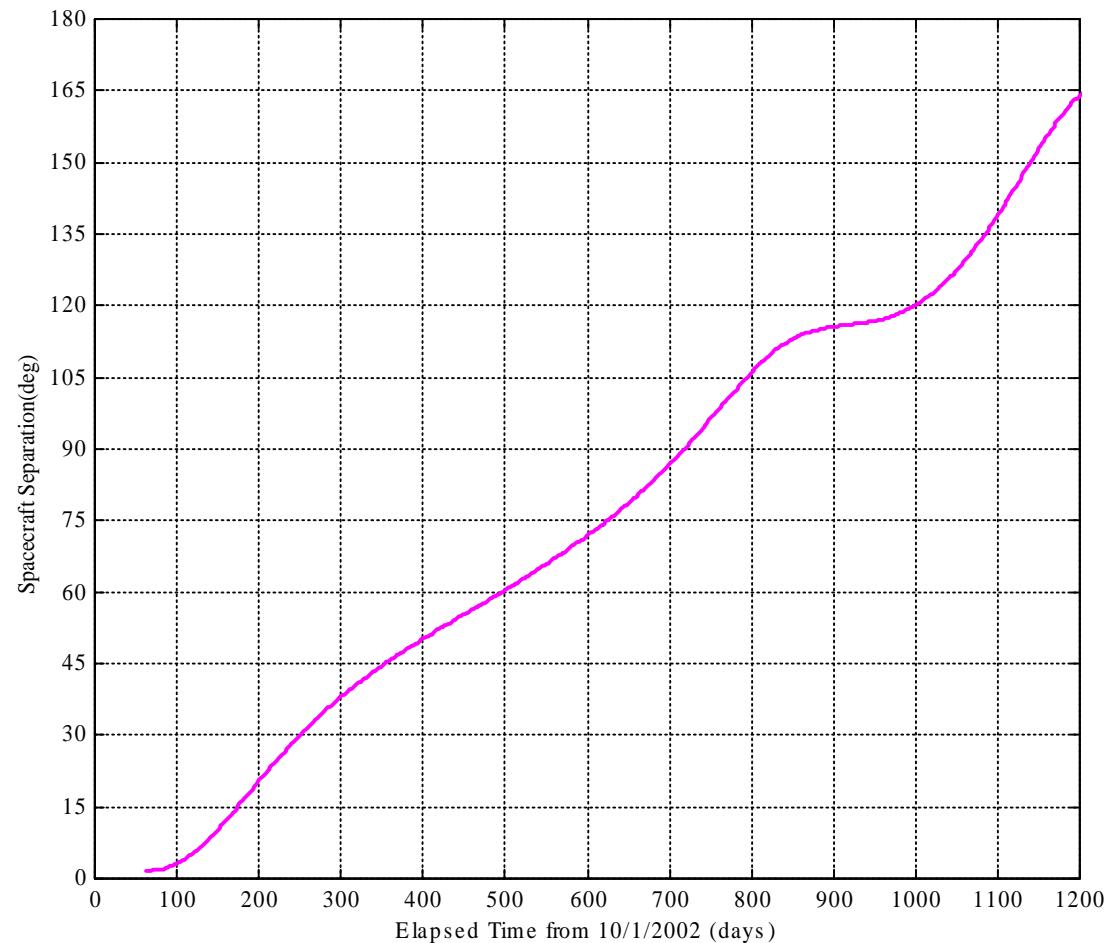
(Geocentric Solar Ecliptic Coordinates)



Earth-Sun-Probe Angle



Spacecraft Separation (Alpha angle)



Sun-Probe-Earth Angle

